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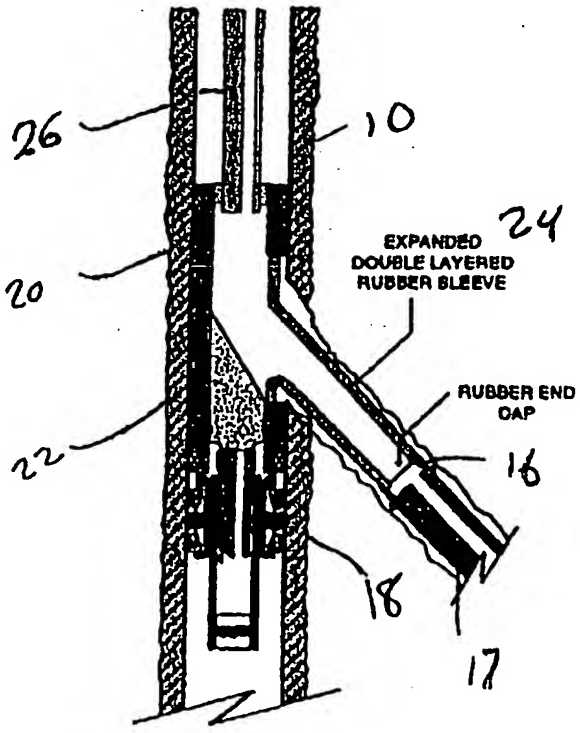
(54) Title: CEMENT REINFORCED INFLATABLE SEAL FOR A JUNCTION OF A MULTILATERAL

(57) Abstract

A multilateral fluid filled inflatable sealed packer utilizes a double layer inflatable sleeve (24) to extend into and seal off the junction in a multilateral well. The double layer elastomer (or reinforced elastomer) defines a material filling area so that subsequent to deploying the double layer elastomeric material into the lateral, an inflation material may be pumped into the void between the two elastomeric layers and a reliable junction seal can thereby be formed. The double layer elastomeric sleeve is generally run downhole in the inverted position (i.e., inside the transport tubing section) wherein the sleeve is maintained within a tubing segment having a premachined window. The double walled elastomeric section is bonded and/or otherwise sealed to the tubing (20) around the periphery of the premachined window. A valve (28) is also disposed in the tubing in an area between the inner layer of elastomeric material and the outer layer of elastomeric material such that the filling material may be applied through the valve into a designated area. The elastomeric sleeve is deployed by pressuring up on the tubing strip and then is maintained in the desired position by a stabilizer. Alternatively the stabilizer itself deploys the sleeve. The stabilizer is preferably run subsequent to deployment of the elastomeric sleeve to maintain its position during inflating. Subsequent to the filling procedure the elastomeric sleeve is milled at the end thereof in order to connect to a preinstalled lateral liner. The invention provides advantages such as improved sealing over jagged or irregular windows unsuitable for other available sealing systems. Simple and efficient operation prolongs effective seal life. Further benefits include an uncontaminated junction, high pressure capability and unlimited seal length.



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CEMENT REINFORCED INFLATABLE SEAL FOR A JUNCTION OF A MULTILATERAL

Background of the Invention:

Field of the Invention:

This invention relates generally to the completion of junctions between primary and lateral wellbores. More particularly, this invention relates to a new and improved method and device for sealing the junction of a branch wellbore extending laterally from a primary well which may be vertical, substantially vertical, inclined or even horizontal. This invention finds particular utility in the sealing of junctions of multilateral wells, that is, downhole well environments where a plurality of discrete, spaced lateral wells extend from a common primary wellbore.

Lateral well drilling and production have been increasingly important to the oil industry in recent years. While lateral wells have been known for many years, only relatively recently have such wells been determined to be a cost effective alternative (or at least companion) to conventional well drilling. Although drilling a lateral well costs substantially more than its vertical alternative, a lateral well frequently improves well productivity by several fold. Lateral drilling provides the means for enhancing field economics by accessing and developing reservoirs that would otherwise be uneconomic to develop using conventional drilling and completion practices. Hydrocarbon reservoirs that are ideal candidates for lateral technology are those that are thin and

limited in size, multi faulted, or naturally fractured. Other reasons for employing laterals are to address reservoir vertical conformance, oil and gas coning potential and sweep efficiency. Environmental issues, such as the number of drilling sites in sensitive areas can also be addressed with lateral technology. In addition, improved field development economics can be achieved in large reservoirs using multiple laterals by improving the productivity of individual wells thereby reducing investment and operational costs.

Some wells contain additional wellbores extending laterally from the lateral . These additional lateral wells are sometimes referred to as drain holes and primary wells containing more than one lateral well are referred to as multilateral wells. Multilateral wells are becoming increasingly important, both from the standpoint of new drilling operations and from the increasingly important standpoint of reworking existing wellbores including remedial and stimulation work.

As a result of the foregoing increased dependence on and importance of lateral wells, lateral well completion, and particularly multilateral well completion have posed important concerns and have provided (and continue to provide) a host of difficult problems to overcome. Lateral completion, particularly at the juncture between the primary and lateral wellbore is extremely important in order to avoid collapse of the well in unconsolidated or poorly consolidated formations. Thus, open hole completions are limited to competent rock formations; and even then, open hole completions are inadequate in many cases since there is limited control or ability to re-access (or re-enter) the lateral or to isolate production zones within the well. Coupled with this need to complete lateral wells is the growing desire to maintain the size of the wellbore in the lateral well as close as possible to the size of the primary wellbore for ease of drilling and completion.

Conventionally, lateral wells have been completed using either slotted liner completion, external casing packers (ECP's) or cementing techniques. The primary purpose of inserting a slotted liner in a lateral well is to guard against hole collapse. Additionally, a liner provides a convenient path to insert various tools such as coiled

tubing in a lateral well. Three types of liners have been used: (1) perforated liners, where holes are drilled in the liner, (2) slotted liners, where slots of various width and depth are milled or wire wrapped along the liner length, and (3) prepacked liners.

Slotted liners provide limited sand control through selection of hole sizes and slot width sizes. However, these liners are susceptible to plugging. In unconsolidated formations, wire wrapped slotted liners have been used to control sand production. Gravel packing may also be used for sand control in a lateral well. The main disadvantage of a slotted liner is that effective well stimulation can be difficult because of the open annular space between the liner and the well. Similarly, selective production (e.g., zone isolation) is difficult.

Another option is a liner with partial isolations. External casing packers (ECP's) have been installed outside the slotted liner to divide a long lateral well bore into several small sections. This method provides limited zone isolation, which can be used for stimulation or production control along the well length. However, ECP's are also associated with certain drawbacks and deficiencies. For example, normal lateral wells have many bends and curves. In a hole with several bends it may be difficult to insert a liner with several external casing packers.

Finally, it is possible to cement and perforate medium and long radius wells, as shown, for example, in U.S. Patent 4,436,165.

The problem of lateral wellbore (and particularly multilateral wellbore) completion has been recognized for many years as reflected in the patent literature. For example, U.S. Patent 4,807,704 discloses a system for completing multiple lateral wellbores using a dual packer and a deflective guide member. U.S. Patent 2,797,893 discloses a method for completing lateral wells using a flexible liner and deflecting tool. Patent 2,397,070 similarly describes lateral wellbore completion using flexible casing together with a closure shield for closing off the lateral. In Patent 2,858,107, a removable whipstock assembly provides a means for locating (e.g., re-entry) a lateral subsequent to completion thereof. Patent 3,330,349 discloses a mandrel for guiding and completing multiple lateral wells. U.S. Patent No. 5,318,122, which is assigned to

the assignee hereof and incorporated herein by reference, discloses deformable devices that selectively seal the juncture between the primary and lateral wells using an inflatable mold which utilizes a hardenable liquid to form a seal, expandable memory metal devices or other devices for plastically deforming a sealing material. U.S. Patent Nos. 4,396,075; 4,415,205; 4,444,276 and 4,573,541 all relate generally to methods and devices for multilateral completion using a template or tube guide head. Other patents and patent applications of general interest in the field of lateral well completion include U.S. Patent Nos. 2,452,920, 4,402,551, 5,289,876, 5,301,760, 5,337,808, Australian patent application 40168/93, U.S. Application Serial No. 08/306,497 filed September 15, 1994 which is assigned to the assignee hereof and incorporated herein by reference, and USSN 08/188,998 filed January 26, 1994, now U.S. Patent No. 5,474,131 which is also commonly assigned and incorporated herein by reference.

Notwithstanding the above-described attempts at obtaining cost effective and workable lateral well completions, there continues to be a need for new and improved methods and devices for providing such completions, particularly sealing between the juncture of primary and lateral wells, the ability to re-enter lateral wells (particularly in multilateral systems) and achieving zone isolation between respective lateral wells in a multilateral well system.

Some of the most recent developments include the following: one method for cementing the junction between the main borehole and the lateral borehole addresses the issue of creating a window in the main (or primary) hole, drilling a lateral wellbore and then sealing the juncture between the lateral and primary wellbores to have the ability to re-enter each lateral wellbore as well as to maintain the option to perform any function that could be done in a single wellbore. For this reason, cemented lateral wellbores are desirable so that normal isolation, stimulation or any other operation can be achieved.

In accordance with this prior art method, prior to running in a novel "hook" liner

system described hereinafter, a standard whipstock is used to mill out a window in the side of the casing of the primary wellbore at the location where it is desired to drill a lateral wellbore.

In accordance with this prior art method, prior to running in a hook hanger system (fully described in U.S. Patent 5,477,925, and briefly described hereinafter) a standard whipstock is used to mill a window in the side of the casing of the primary wellbore at the location where it is desired to drill a lateral wellbore.

The hook liner hanger is run on top of the lateral liner. The liner is run into the main casing and then out through the aforementioned milled window. The hook liner hanger has a pre-machined window, a hook system, and a re-entry system. When the hook on the hanger locates on the main casing milled window, it orients the hanger, so that the pre-machined window is aligned with the lower part of the main casing below the milled window. The running system for the hook liner hanger, includes a method of isolating the pre-machined window from the bore of the hook liner hanger. If desired the liner can be cemented in place, using standard cementing techniques commonly used in regular liner placements. The hook liner hanger can be run in various combinations to suit the needs of the wellbore. These combinations can include equipment such as external casing packers, sand control screens, partially cemented liner, fully cemented liner, and liner hanger packers.

When the hook hanger is to be cemented in place, a tube is attached to the lower end of the liner hanger running tool that extends below the pre-machined window. The annular space between the tube and the Liner Hanger body is sealed, so that the cement does not circulate back through the pre-machined window. After the cement has been pumped in place, the tube can be pulled back above the pre-machined window and then diverted back down through the pre-machined window to clean out the flow path back to the main casing below the milled window.

A variation of the hook liner hanger is a version where the formation can be hydraulically sealed from the lateral liner, the lower main casing and the upper main casing. A short section of casing extends from the periphery of the pre-machined

window in the hook liner hanger. The end of this section is cut obliquely so that when being run it is possible to run inside the main wellbore casing, yet when landed will still extend from the hook liner hanger. After the hook liner hanger is fully positioned and any cementing has taken place, a tie back assembly is employed which will go through the pre-machined window in the hook liner hanger and land in the packer positioned below the window which was initially positioned for the whipstock. When the anchor lands in the packer it will orient in the same manner as the whipstock did. The orientation will also align a seal system which will land in the short section of casing extending from the hook liner hanger. The seal system can be of any of the common types such as a packing element, chevron seal system, or an interference seal system.

The "hook" liner hanger system includes a "hook" and is run into the wellbore and then through the aforementioned milled window. The "hook" liner hanger system is run into the lateral wellbore until the "hook" hanger locates on the milled window in the main primary wellbore. Inside the "hook" liner hanger system is a tail pipe assembly with adjustable opposing swab cups. The tail pipe assembly carries liquid cement or other fluids as required to inflate external casing packers or other devices as required. The end of the "hook" hanger liner is then plugged to allow the hydraulic set hanger to set by means of applied pressure. An external casing packer located near the end of the "hook" liner hanger system is then inflated to seal the lateral wellbore annular space just below the cementing valve of the "hook" liner hanger system. Opposing "swab-cups" are used to direct fluid to inflate the external casing packer.

The tailpipe assembly string is then withdrawn high enough to allow the end of the tailpipe assembly string to be pulled from the lateral wellbore and then lowered into the main wellbore through the premilled window of the "hook" liner hanger system to assist in reducing debris from falling into the main wellbore. While the system does create a good sealed junction it is a difficult process and an easier and more speedy process is always desirable.

U.S. Patent number 5,318,122 discloses a number of embodiments employing differing forms and hardenable filling materials. The methods include employing 1)

an inflatable mold which utilizes a hardenable liquid like epoxy or cement; 2) expandable memory metal devices; 3) swaging devices for plastically deforming a sealing material; 4)liner seals for sealing between the liner and the primary bore; and 5) side pocket devices to guide a liner into the lateral.

All of the prior art devices and methods while performing well for their intended functions are still in need of improvement. A particular area of improvement desired is in the cement at the junction which in present art is employed as both the junction and the seal. This works marginally well and is subject to failure due to limitations in the cement material itself or the ability to place the cement successfully at the junction. More particularly, under the conditions downhole, cement can fail by deteriorating to such an extent that the seal begins to leak thus contaminating the production. Therefore it is desirable to provide alternate junction creating and sealing arrangements which may be more reliable and improved performance under downhole conditions.

Summary of the Invention

The above discussed drawbacks and deficiencies of the prior art are overcome or alleviated by the multilateral fluid filled inflatable sealed packer junction of the invention. The invention comprises a tubular section including a premachined window and a prebonded double layer elastomeric sleeve. The sleeve may be only elastomeric material or may be reinforced with steel cables, mesh or Kevlar, etc. Further included is a valve positioned in the tube advantageously to apply a fluid, preferably cement slurry but any fluid is acceptable, to the space defined by the inner and outer layers of the double walled elastomeric sleeve.

As one of ordinary skill in the art will immediately appreciate, prior to the operation of the invention a primary wellbore is drilled and cased, a packer is set, a whipstock is placed in communication with the packer and a drillstring is kicked off to mill a lateral window and drill a lateral wellbore. Moreover, a liner for the lateral borehole is preinstalled and preferably includes a tie back sleeve at the uphole end

thereof. Subsequent to these operations, the device of the invention is run downhole to the vicinity of the lateral window. As will be recognized, orientation of the device of the invention is required in order to ensure that the elastomeric sleeve deploys within the lateral borehole. Orientation is generally accomplished by employing the original whipstock packer with an orientation sub or by employing orientation slots and orientation lugs on various sections of the device of the invention.

In the running position, the elastomeric sleeve is carried inside out within the lumen of the tubing section to which it is bonded. This both protects the elastomeric sleeve during the trip downhole and also minimizes difficulties caused by catching or jamming. It is important to note that although bending is the most preferred attachment of the sleeve to the tool, the only requirement is a pressure tight seal therebetween. This may be accomplished by cables, glue, hose-clamp-like devices, etc. The downhole end of the tubing section of the invention includes a plug so that the tubing may be pressured up upon in order to deploy the double walled elastomeric sleeve of the invention. It is preferable to deploy the sleeve with hydraulic pressure, however, it is possible to deploy the same simply by pushing it out with the stabilizer. It should be noted that the sleeve may be of any length and is commonly of 30-40 feet in length. Because of the length, a reasonably significant pressure may be required to fully deploy the sleeve thus making the plug at the downhole end of the tubing section highly desirable.

The tubing section further includes a premachined window around which the double layer elastomeric sleeve is bonded. Adjacent the window is a fluid valve such as Baker Oil Tools Part No. 04-30-108-00 which is employed subsequent to deploying the elastomeric sleeve into the lateral borehole. A stabilizer sleeve is next installed into the extended lateral inflatable elastomer sleeve to maintain the sleeve in a desirable position for cementing or otherwise filling. The stabilizer includes a rounded end section to avoid damaging the elastomeric sleeve. The round end section may be of any number of materials including metal, rubber and plastic. The fluid valve is actuated by pressure exerted by the filling fluid itself and facilitates filling the space defined by the

two layers of the elastomeric sleeve such that the junction may be sealed. Subsequent to sealing of the junction by inflating the sleeve the downhole end of the elastomeric sleeve is milled to remove both the rubber and fluid in that area (a preferred embodiment includes only a single layer at the end of the sleeve, thus avoiding the need to remove the fluid from that section) and to connect the tieback sleeve on the preinstalled liner to the inflated junction. The stabilizer is sheared off, the whipstock retrieved and the borehole is completed. A high pressure sealed junction is created by the invention which has the additional advantages of sealing around jagged or irregular windows unsuitable for other available systems and provides uncontaminated inflation material, any length of seal desired and increased versatility.

The above-discussed and other features and advantages of the present invention will be appreciated and understood by those skilled in the art from the following detailed description and drawings.

Brief Description of the Drawings:

Referring now to the drawings wherein like elements are numbered alike in the several FIGURES:

FIGURE 1 is a cross-section view of a section of a primary casing with a lateral having been drilled;

FIGURE 2 is a cross-section elevation view of a the tool of the invention deposited within the illustration of FIGURE 1 with the inflatable sleeve in the run-in position;

FIGURE 3 is an illustration of the invention with the sleeve in the deployed position;

FIGURE 3A is a cross-section elevation view similar to FIGURE 3 but schematically rendered which illustrates the double layer sleeve more clearly by removing other elements of the invention;

FIGURE 4 is an illustration similar to FIGURE 3 except that a stabilizer has been kicked-off the guide stock and is supporting the inflatable sleeve for filling with a suitable medium;

FIGURE 5 is a cross-section elevation view similar to the foregoing views and sequential thereto in that the stabilizer has been sheared out and removed uphole; and

FIGURE 6 is a further sequential view where the guide stock has been removed from the well.

Detailed Description of the Preferred Embodiment:

Referring to FIGURE 1, casing 10 has been drilled out to provide a window 12 and a lateral borehole 14. A lateral liner 17 with tie back extension 16 has been installed in the borehole 14 and a residual packer from the original whipstock is still present downhole. Generally, the illustration of FIGURE 1 is that known to the prior art.

Referring to FIGURE 2, the invention is illustrated wherein an inflate housing 20 including a spear retrievable guide stock 22, an uninflated double layered rubber sleeve 24 and a stabilizer joint 26 are positioned appropriately adjacent the window 12. As one of ordinary skill in the art will immediately recognize, the device of the invention must be properly oriented to carry out the intended operation. Most preferably, the packer 18 provides orientation for the assembly in a known manner. Alternatively, slot and lug systems may be employed to orient the tool in the proper position. Moreover, the slot and lug type arrangements can be employed to selectively locate or pass by particular laterals thereby providing even more versatility to the invention. In this position, the device of the invention is poised for deployment preferably upon hydraulic pressuring from the surface (or by simply inserting the stabilizer, if desired). Subsequent to hydraulic pressurizing, expanded double layered rubber sleeve 24 is visible in FIGURE 3. It should be appreciated that a rubber end cap is most preferably a single layer of rubber, but may be a double layer to reduce manufacturing costs. The double layer end generally will require removal of the filing

medium in that vicinity to connect the stabilizer to the lateral liner. As one of skill in the art will readily appreciate, the length of rubber sleeve 24 preferably is sufficient to engage the tie back extension 16 of lateral liner 17. It is possible, however, for the stabilizer to span any distance there might be between the end of the sleeve and the tieback extension. In general, the tie back extension 16 of lateral liner 17 is placed from 20-40 feet away from the junction between the lateral and the primary casing. The rubber sleeve 24 will preferably be manufactured to span the same distance or as long as reasonably possible while still functioning in the desired manner.

While the rubber sleeve 24, immediately after deployment in the most preferred embodiment, is pressured internally with hydraulic fluid, that fluid pressure is not sufficient to maintain the internal diameter of the bore therein during inflation between the two layers of the rubber sleeve 24. More specifically, if hydraulic pressure alone were relied upon while filling the inflation space, the rubber sleeve 24 would collapse upon its own lumen thus occluding the lateral. For this reason, stabilizer joint 26 is driven down hole and off of guide stock 22 into the lateral through the ID of rubber sleeve 24 and into stabbing connection with the tie back extension 16 of liner lateral 17. Stabilizer 26 maintains the I.D. of sleeve 24 to prevent collapse. By design, an isolating cement tool, Baker Oil Tools Part No. 301-42-4501 will be in position to mate with valve 28 illustrated in FIGURE 3A when rounded end 27 of stabilizer joint 26 comes in contact with tie back extension 16 of lateral liner 17. Isolating tool 30 ensures that no (or very little) contamination gets into the area between the double layered rubber sleeve 24. Once in position, isolating cement tool 30 opens a column of cement included inside the tool and allows that cement to be forced through valve 28 to fill the sleeve. Since the stabilizer joint 26 is positioned within the lumen of the sleeve the predetermined ID is maintained. It is important to note that while cement is the most preferred embodiment of the invention, that any other suitable fluid material may be used to fill the sleeve. These materials include drilling fluid, mud, epoxy resins. water

or any other fluid. It is not necessary for the fluid to harden or even be hardenable. Any fluid is capable of filling the sleeve, cement is, however, preferred. Cement is preferred for longevity of the junction.

Referring again to FIGURE 4, a shear out sub 32 is illustrated which will be employed immediately after inflation is complete. The top half of stabilizer joint 26 along with the isolating cement tool are drawn uphole thus shearing out the shear out sub 32 and allowing the lower portion of the stabilizer joint to remain in the lateral. This is illustrated in FIGURE 5. A spear is then run to pull out the guide stock.

FIGURE 6 illustrates the finished junction having unobstructed access to both the lateral and the primary casing. As one of skill in the art will readily appreciate, the mechanical integrity of the joint is sufficient to withstand high differential pressures in production.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustrations and not limitation.

What is claimed is:

CLAIM 1. Apparatus for sealing a junction between a primary wellbore and a lateral wellbore comprising:

a housing having a window therein attachable to a tubing string and having access to an inflation fluid supply;

a double walled inflatable sleeve in fluid communication with said fluid supply;

an orientation sub disposed at the downhole end of said housing, said orientation sub ensuring that said window is substantially aligned with said junction;

a relatively rigid sleeve disposed within said housing and moveable into said inflatable sleeve after extension of said inflatable sleeve.

CLAIM 2. Apparatus for sealing a junction between a primary wellbore and a lateral wellbore as claimed in claim 1 wherein said fluid supply is selected from cement and epoxy.

CLAIM 3. Apparatus for sealing a junction between a primary wellbore and a lateral wellbore as claimed in claim 1 wherein said double walled sleeve is elastomeric.

CLAIM 4. Apparatus for sealing a junction between a primary wellbore and a lateral wellbore comprising:

a housing having a window therein attachable to a tubing string and having access to an inflation fluid supply;

a double walled inflatable sleeve in fluid communication with said fluid supply;

an orientation sub disposed at the downhole end of said housing, said orientation sub ensuring that said window is substantially aligned with said junction.

CLAIM 5. A method for sealing the junction between a primary wellbore and a lateral wellbore comprising:

providing the apparatus of claim 1;

running said apparatus downhole to a predetermined location and orienting said housing;

pressuring up from a surface location to flow a supply of fluid from said fluid supply to said double walled inflatable sleeve;

sliding said relatively rigid sleeve into said inflatable sleeve.

CLAIM 6. A method for sealing the junction between a primary wellbore and a lateral wellbore as claimed in claim 5 wherein said flowing of fluid and said sliding of said relatively rigid sleeve are substantially contemporaneous.

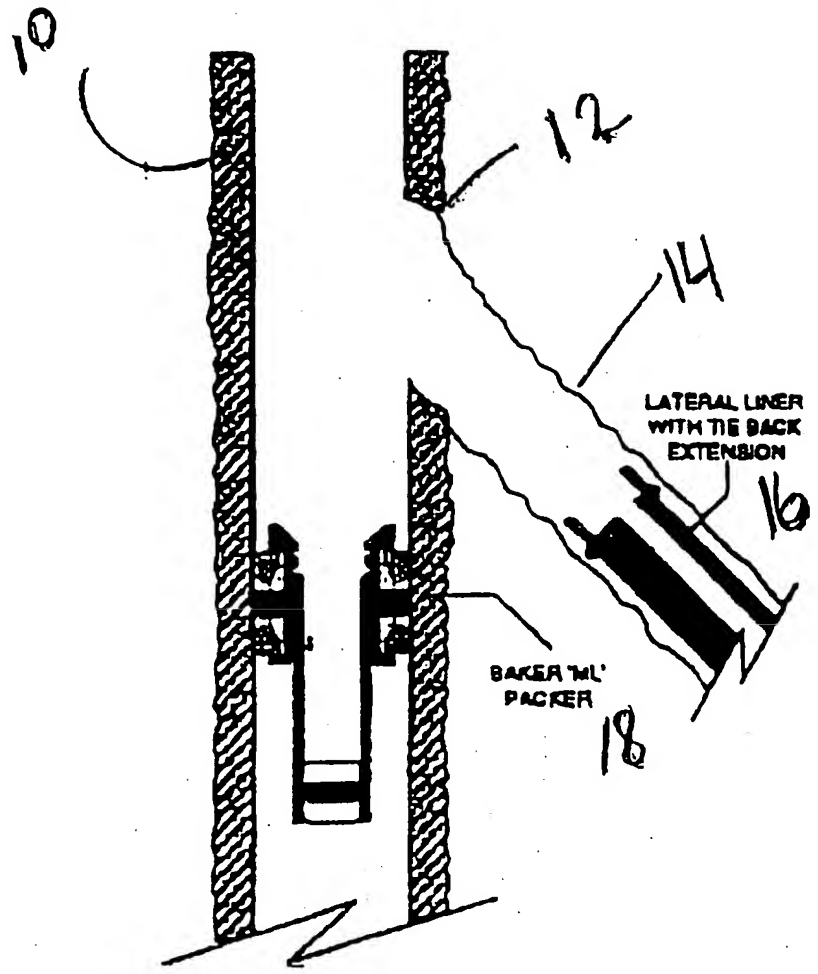

10
12
14
LATERAL LINER
WITH TIE BACK
EXTENSION
16
BAKER 'ML'
PACKER
18

FIG. 1

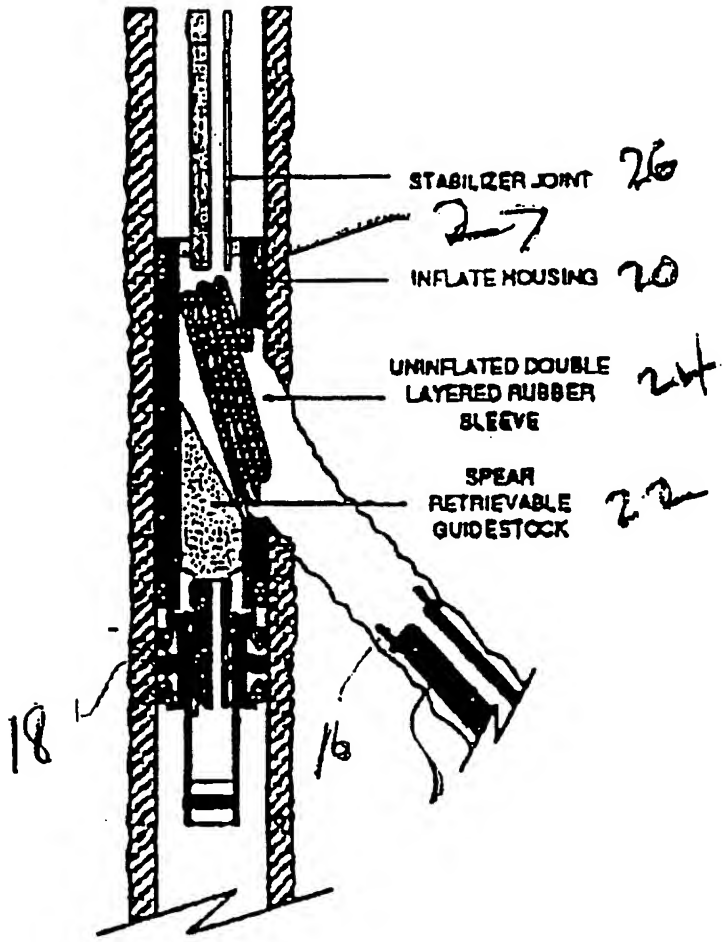
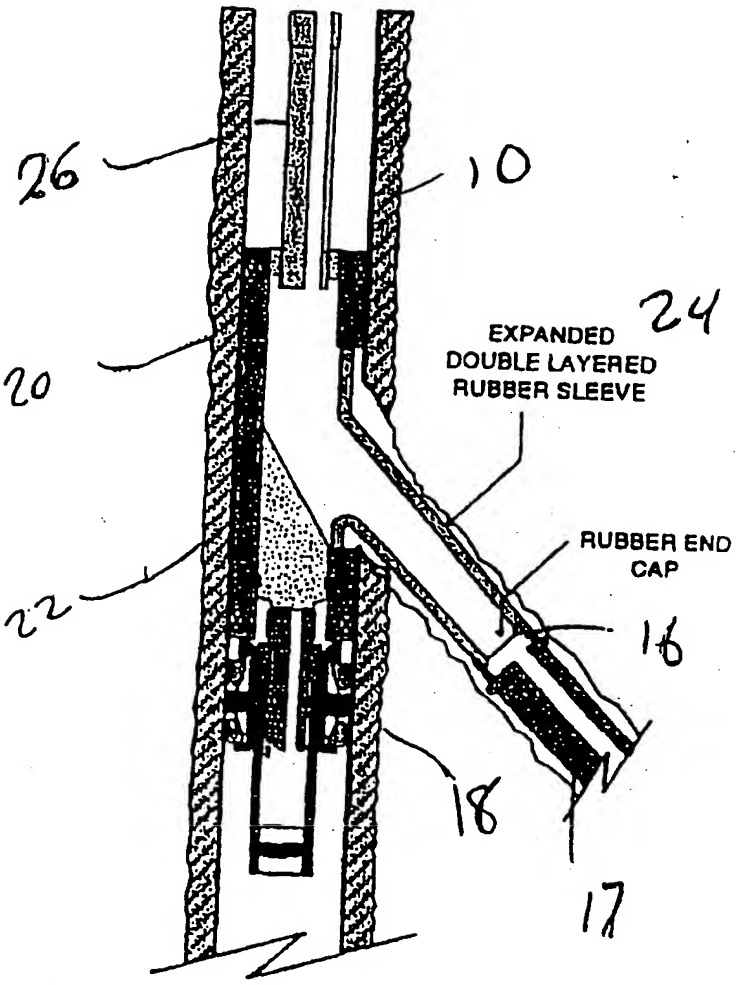

STABILIZER JOINT 26
27
INFLATE HOUSING 20
UNINFLATED DOUBLE LAYERED RUBBER SLEEVE 24
SPEAR RETRIEVABLE GUIDESTOCK 22
18
16

FIG 2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10
24
EXPANDED
DOUBLE LAYERED
RUBBER SLEEVE
20
RUBBER END
CAP
22
16
18
17

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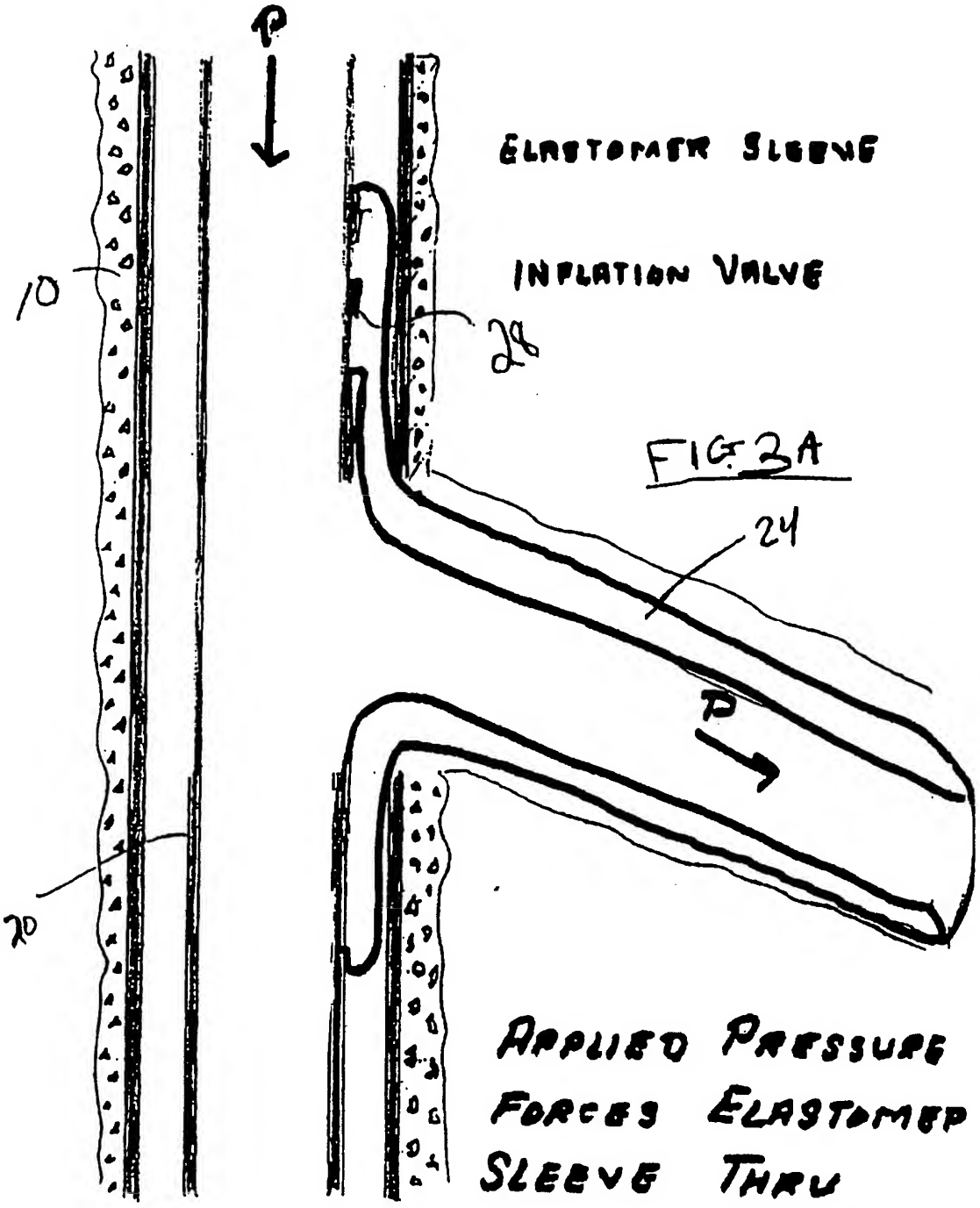


FIG 3A

APPLIED PRESSURE FORCES ELASTOMER SLEEVE THRU MILLED WINDOW

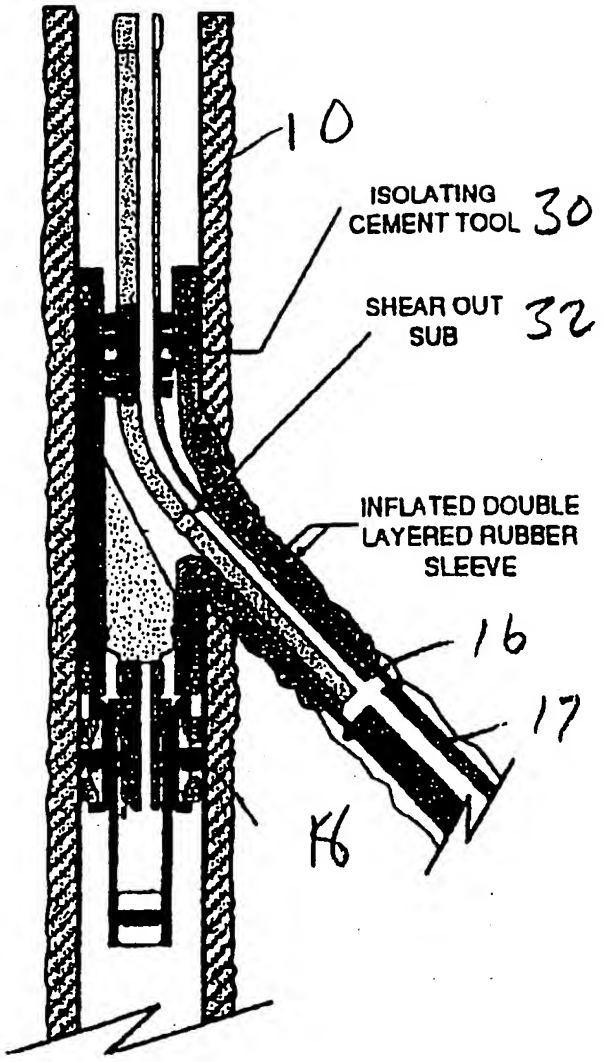

10
ISOLATING CEMENT TOOL 30
SHEAR OUT SUB 32
INFLATED DOUBLE LAYERED RUBBER SLEEVE
16
17
16

FIG. 4

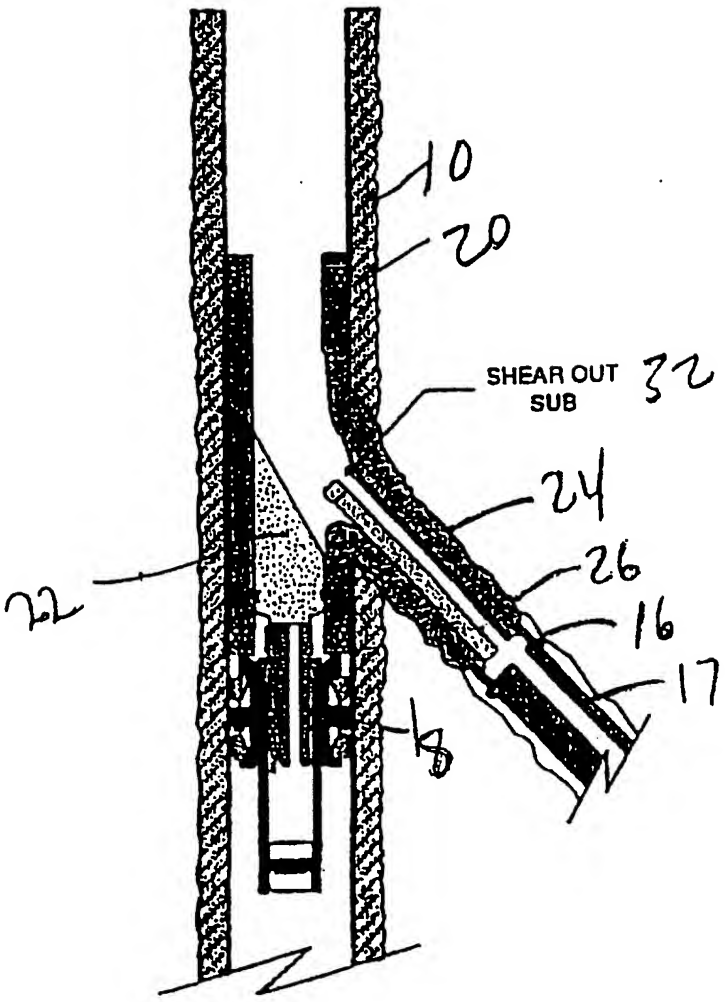
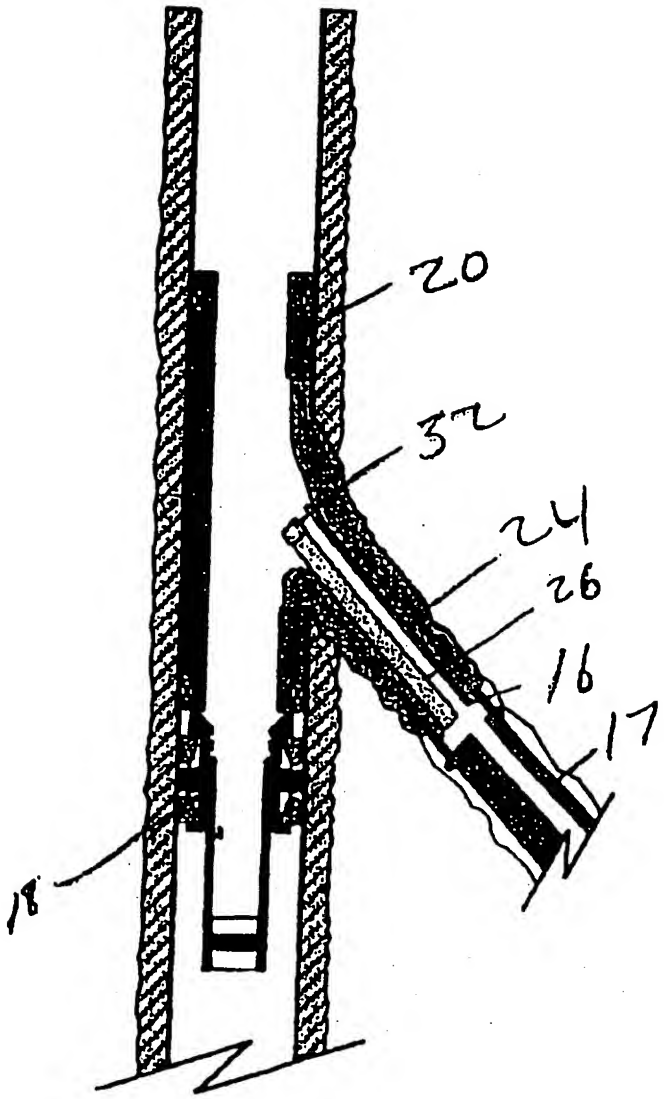


FIG. 5



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INTERNATIONAL SEARCH REPORT

Interr ıal Application No
PCT/US 97/15277

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E21B33/14 E21B43/30 E21B33/127 E21B43/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 388 648 A (JORDAN JR HENRY J) 14 February 1995 see column 6, line 35 - column 7, line 18 see column 18, line 60 - column 19, line 68 see figures 1A,1B,17A-17F	1,4,5
A	US 5 526 880 A (JORDAN JR HENRY J ET AL) 18 June 1996 see column 9, line 18-31 see figure 2H	1,4,5
A	EP 0 701 045 A (HALLIBURTON CO) 13 March 1996 see page 12, column 19, line 19-32 see figure 4	1,4,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
10 December 1997	19/12/1997

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Schouten, A

INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Interna... ...al Application No
PCT/US 97/15277

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